A.D 1891. JUNE 15. Nº 10,135.*

JUSTICE'S AMENDED SPECIFICATION

Mashing-Apparatus-Mash-tubs.

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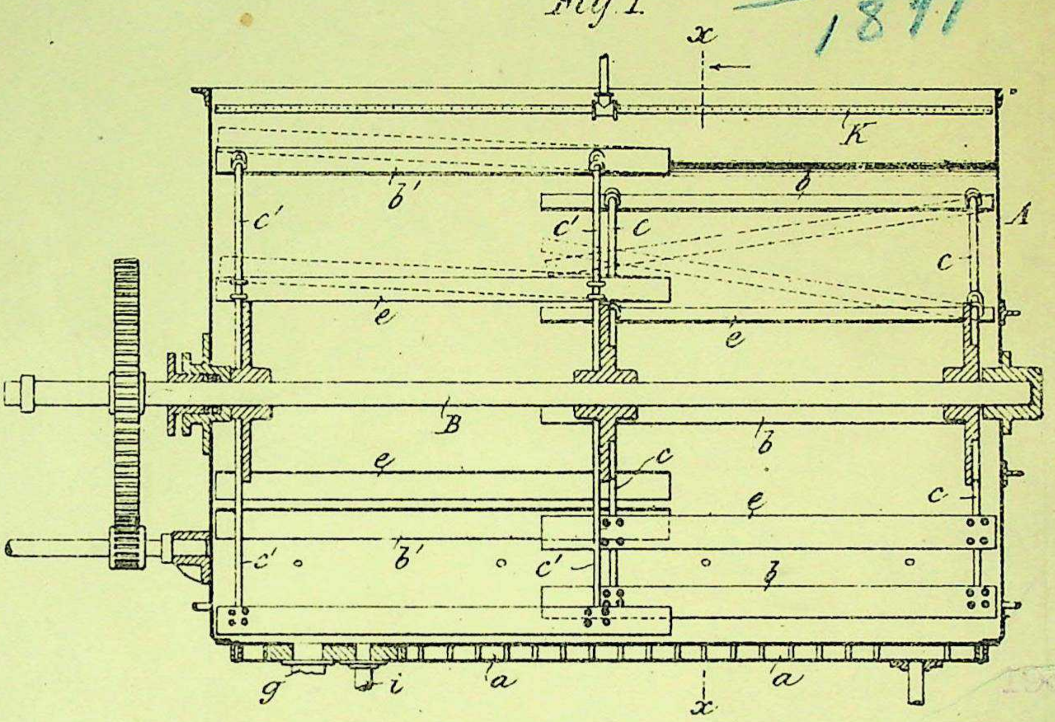
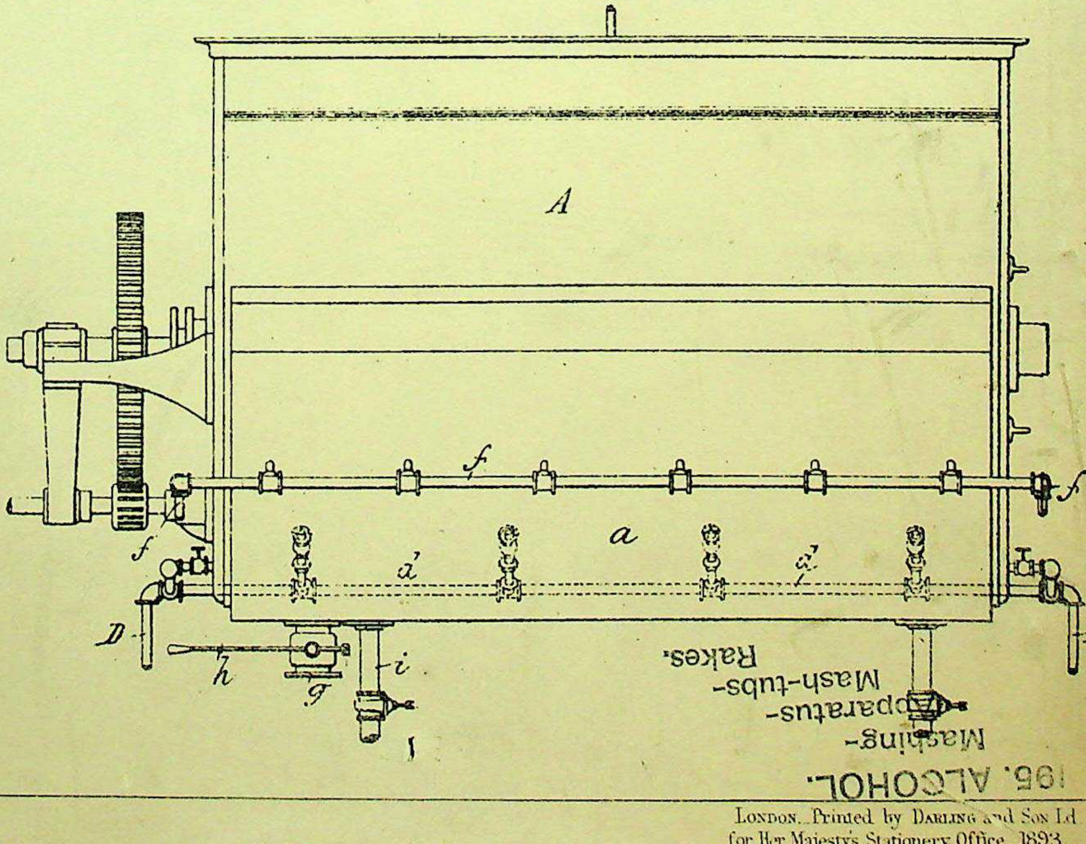
10,135
1891

Fig. 1.



DIV. 31

Fig. 3.



195. ALCOHOL.
Mashing-
Apparatus-
Mash-tubs.
Rakes

195. ALCOHOL.
Mashing-
Apparatus-
Mash-tubs-
Rakes.

LONDON. Printed by DARLING and SON Ld
for Her Majesty's Stationery Office. 1893.

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195
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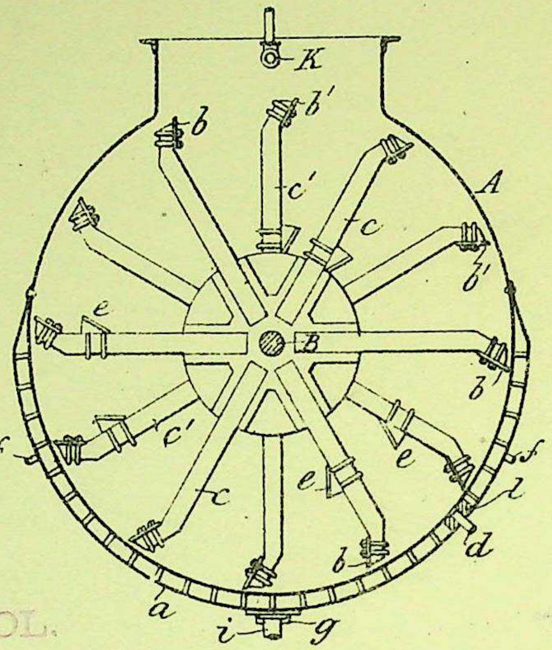
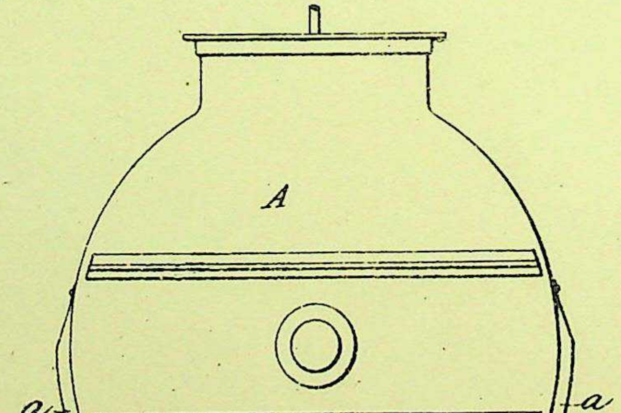
10,135
1891

Fig. 2.



DIV. 31

Fig. 4.



[This Drawing is a reproduction of the Original on a reduced scale]

195. ALCOHOL.
Mashing-
Apparatus-
Mash-tubs-
Rakes.

Malby & Sons, Photo-Litho.

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1892
31 ①

426/29

The decision of the Comptroller-General, of the 2nd day of December 1892, allowed, under Section 18 of the Patents, &c. Act, 1883, an Amendment of this Specification.

[*The Amendments are shown in italic type.*]

RECORDED

N° 10,135* A.D. 1891

Date of Application, 15th June, 1891
Complete Specification Left, 14th Mar., 1892—Accepted, 16th Apr., 1892

PROVISIONAL SPECIFICATION.

An Improved Method of and Means for Manufacturing Beer and Ale.

A communication from abroad by ANDREW WORTHINGTON BILLINGS, of 997 Bedford Avenue, Brooklyn, in the State of New York, United States of America, Chemist.

I, PHILIP MIDDLETON JUSTICE, of 55 and 56 Chancery Lane, in the County of Middlesex, Fellow of the Institute of Patent Agents do hereby declare the nature of this invention to be as follows:—

The use of raw grain in the manufacture of beer or ale has generally proved to be ineffective and where it has been employed with more or less success it has hitherto required the making of two mashes, one a supplemental mash containing raw grain, water and a portion of the malt used in the brew; the other or main mash consisting entirely of malt and water. A supplemental mash has heretofore been considered absolutely essential because of the high temperature and thorough agitation required to completely disintegrate and rupture the starch cells of the raw grain which can be done in the supplemental mash but another mash for the main malt is considered necessary because the exposure of the malt to the same agitation and high temperature would coagulate the diastase destroying the starch converting power and render difficult the subsequent filtration. The two mashes have therefore been separately prepared and then combined and the mashing operation completed.

Among the disadvantages of this method of manufacture are the increased cost of apparatus the additional skilled labour, time and steam required, the uncertainty of the yield and serious difficulties in filtering the water where the mashes are not properly mixed.

One object of this invention is to obviate the above difficulties by means of an improved process, and another object is to provide means for carrying out such process.

In working the improved process the raw grain either whole or ground together with a suitable proportion of malt say from 1 to 25 *per cent.* of the weight of the grain, and the necessary water, are introduced into a suitable mashing apparatus whereby the temperature of the mash may be quickly varied as required. After such introduction the temperature is gradually raised to about 146° Fahrenheit, whereby to enable the diastase which is most active at that temperature to convert any free starch present in the mass and to soften the outer cell walls in which the starch granules are contained. After this effect has been accomplished the mash is rapidly increased in temperature to a point sufficiently high to thoroughly gelatinize the starch contained in the raw grain. This point will depend upon the character of the grain and should not exceed at the utmost 200° Fah. even with grain of the most refractory character and the treatment is continued at this temperature until the thorough disintegration of the outer walls and the liberation of the granules of

[*Price* 8*d.*]

starch is effected, but the temperature should not be maintained after such liberation as it would result in a decomposition of fats and the production of empyreumatic products, which would render the solution unfit for the manufacture of a merchantable product. As soon therefore as the outer cuticle is broken up and the starch granules are liberated the mash is cooled down as rapidly as possible to below 165° Fah. and the remainder of the malt required for the brew is added with more water, if it is necessary, care being taken to avoid lowering the temperature to below 155° which would result in forming lactic acid.

The mash is now discharged rapidly from the tub into a separate and independent filtering tub. This rapid discharge of the mash into another tub is an important step in the improved method of manufacture and may be employed in other methods of manufacture where required as thereby the two substances are brought into intimate mixture with each other over the entire perforated filtering bottom the particles of corn being so effectually mixed with the malt that there can be no cementation of these particles together and the starch is thoroughly subjected to the action of the diastase and a perfect result is secured. In the ordinary method of manufacture where the malt and corn are thrown separately into a tub having a perforated bottom the corn grains stick together in masses preventing the extraction of maltose and the corn being heaviest goes to the bottom and coagulates in a mass covering the filtering openings.

This process may be carried out with apparatus of different forms but a preferred form consists of an improved tub having a hollow bottom preferably curved, with a suitable steam space.

A shaft concentric with the bottom carries two sets of arms, one set near one end of the shaft carrying blades, while the other set near the other end of the shaft also carry blades, so that the blades instead of extending the whole length of the shaft extend each one-half the length the two series alternating and each blade being so inclined at an angle to the arm and if desired supplemental blades may be carried by the arms and also some of the blades may be arranged to converge from opposite sides alternating with other blades diverging from the centre. By this means the substances of the thick mash are thoroughly comingled and quickly worked together so that all can be brought simultaneously to the same temperature. Steam from a pipe can be injected directly into the mass from a branch pipe, the nozzle of which points downward so as to operate when there is but a small quantity of mash in the tub and steam is admitted to the space in the jacket through a suitable pipe. The mash is discharged from the tub through a large opening controlled by a valve, and the wash water is discharged from the bottom of the tub through a pipe. All these pipes are provided with suitable valves or cocks, and by means of this construction the entire mass of grain or mash may be quickly raised and lowered in temperature as is necessary to secure the desired effect.

Dated this 15th day of June 1891.

PHILIP M. JUSTICE.

COMPLETE SPECIFICATION (AMENDED).

An Improved Method of and Means for Manufacturing Beer and Ale.

A communication from abroad by ANDREW WORTHINGTON BILLINGS of 997 Bedford Avenue, Brooklyn in the State of New York United States of America Chemist.

I PHILIP MIDDLETON JUSTICE of 55 and 56 Chancery Lane in the County of Middlesex Fellow of the Chartered Institute of Patent Agents do hereby declare the nature of this invention and in what manner the same is to be performed to be particularly described and ascertained in and by the following statement:—

The use of raw grain in the manufacture of beer or ale has generally proved to be ineffective, and where it has been employed with more or less success it has hitherto required the making of two mashes, one a supplemental mash containing raw grain, water, and a portion of the malt used in the brew; the other or main mash consisting entirely of malt and water. A supplemental mash has heretofore been considered absolutely essential because of the high temperature and thorough agitation required to completely disintegrate and rupture the starch cells of the raw grain which can be done in the supplemental mash, but another mash for the main malt is considered necessary because the exposure of the malt to the same agitation and high temperature would coagulate the diastase destroying the starch converting power and render difficult the subsequent filtration. The two mashes have therefore been separately prepared and then combined and the mashing operation completed.

Among the disadvantages of this method of manufacture are the increased cost of apparatus, the additional skilled labor, time and steam required, the uncertainty of the yield and serious difficulties in filtering the wort where the mashes are not properly mixed.

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In working the improved process the raw grain either whole or ground together with a suitable proportion of malt, say from 1 to 25 *per cent.* of the weight of the grain, and the necessary water, are introduced into a suitable mashing apparatus whereby the temperature of the mash may be quickly varied as required. After such introduction the temperature is gradually raised to about 146° Fahrenheit, whereby to enable the diastase which is most active at that temperature, to convert any free starch present in the mass and to soften the outer cell walls in which the starch granules are contained. After this effect has been accomplished the mash is rapidly increased in temperature to a point sufficiently high to thoroughly gelatinize the starch contained in the raw grain. This point will depend upon the character of the grain and should not exceed at the utmost 200° F. even with grain of the most refractory character, and the treatment is continued at the higher temperature until the thorough disintegration of the outer walls and the liberation of the granules of starch is effected, but the temperature should not be maintained after such liberation, as it would result in a decomposition of fats, and the production of empyreumatic products, which would render the solution unfit for the manufacture of a merchantable product. As soon therefore as the outer cuticle is broken up and the starch granules are liberated the mash is cooled down as rapidly as possible to below 165° Fah. and the remainder of the malt required for the brew is added with more water, if it is necessary, care being taken to avoid lowering the temperature to below 155° which would result in forming lactic acid. The mash is now discharged rapidly from the tub into a separate and independent filtering tub. This rapid discharge of the mash into another tub is an important step in the improved method of manufacture, and may be employed in other methods of manufacture where required, as thereby the two substances are brought into intimate mixture with each other over the entire perforated filtering bottom, the particles of corn being so effectually mixed with the malt that there can be no cementation of these particles together, and the starch is thoroughly subjected to the action of the diastase and a perfect result is secured.

In the ordinary method of manufacture where the malt and corn are thrown separately into a tub having a perforated bottom, the corn grains stick together in masses preventing the extraction of maltose, and the corn being heaviest goes to the bottom and coagulates in a mass, covering the filtering openings thereby preventing proper filtration. The mash is usually allowed to stand in the filtering tub from thirty to forty minutes or longer, when the taps can be opened and the filtered wort passing through the perforations in the false bottom can be pumped into the kettle. During this operation hot water at say about 168° Fah. is sparged or sprinkled on the surface of the grains remaining in the filtering tub until the soluble matter contained therein has been thoroughly extracted. The sparge or wash water is then mixed with wort contained in the kettle, and the subsequent boiling of the wort with hops, cooling, and then fermenting, continued as in ordinary brewing.

This process may be carried out with apparatus of different forms but a preferred form is shewn in the accompanying drawings, in which :—

Fig. 1 is a longitudinal sectional elevation.

Fig. 2 is a cross section taken on the line *x*—*x* of Fig. 1.

Fig. 3 is a side elevation, and

Fig. 4 an end elevation of Fig. 3.

A is the improved tub having a hollow bottom and a suitable steam space or jacket *a*.

A cylindrical shape of tub is preferred because oscillation of the machine is less with this form, and because a continuous and thorough agitation of all the grist contained therein is secured by means of the mixing blades which bring the material into direct contact with the heated or cooled surfaces. The whole length of the top of the machine is closed by hinged wooden covers, thereby preventing pressure and obviating the danger of evolving empyreumatic products.

A shaft B concentric with the bottom carries two sets of arms *c c*, c^1 c^1, the arms *c c* carrying blades *b*, while the arms c^1 c^1 carry blades b^1, so that the blades instead of extending the whole length of the shaft extend each more than one-half the length, the two series alternating, and each blade may be so inclined at an angle to the arm that the material will be evenly diffused through the machine owing to its receiving not only a turning but also a longitudinal motion or travel. If desired supplemental blades *e* may be carried by the arms and also some of the blades may be arranged to converge from opposite sides alternating with other blades diverging from the centre, or as indicated by dotted lines. By this means the substances of the mash are thoroughly commingled and quickly worked together so that all can be brought simultaneously to the same temperature without the formation of lumps of the grist or grain. Steam or water from a pipe D can be injected directly into the mass from branch pipes *d*, the arrangement being such that the steam or water is rapidly and uniformly distributed through the mass, thus enabling the temperatures to be readily and absolutely controlled, and insuring a perfect mixture of the materials composing the grist, thus securing an increased and uniform yield.

The pipes *d* pass through the jacket *a* through gun metal thickening pieces *l* riveted between the tub A and jacket *a*, thus enabling the inlets *d* to be placed as near the bottom of the machine as desired, so that either a large or small mash can be made. The thinness of the sheets composing the shells, and their unequal contraction and expansion would render this almost impossible without the thickening pieces.

To further aid in regulating the temperature hot or cold water or steam may be evenly distributed over the mash through the perforated or sparge pipe K. Steam or hot water for heating, and cold water for cooling may be admitted to the space in the jacket *a* through suitable pipes *f*, *f*, *f*. The mash may be rapidly discharged from the tub through a large opening *g* controlled by a valve *h*, and the wash water can be subsequently discharged from the bottom of the tub through a pipe *i*. All these pipes are provided with suitable valves or cocks, and by means of this construction the entire mass of grain or mash may be quickly raised and lowered in temperature as is necessary to secure the desired effect.

Briefly stated the entire operation is as follows :—

The tub A being provided with a suitable quantity of water which is brought to a temperature of about 120° Fah., the raw grain with the requisite quantity of malt is then fed in through the usual openings, while the apparatus is in motion. The temperature is then gradually raised to about 146° Fah., and maintained there for a period of 15 to 20 minutes, after which it is rapidly raised to a point not exceeding 200° Fah., at which point it is maintained until the grain is thoroughly gelatinized, a matter which can be ascertained by drawing off a sample through a suitable test cock. The mixture is then rapidly cooled until it stands at about 160° Fah. when the balance of the malt is added, care being taken not to unduly lower the temperature by this addition. When this addition has been completed the discharge pipe is fully opened and the entire mass rapidly discharged into the filtering tub.

The tub A may also be used as a boiling kettle, for which it is, on account of its immense heating surface, well adapted ; the cylindrical form gives a rolling boil, and with the blades slowly revolving all danger of boiling over is obviated.

By means of the pipe *i* it is possible to wash or clean the tub immediately after use, thus preventing the material baking or adhering to the sides, from which after setting it can only be removed with difficulty. The wash water from this operation should of course be discharged direct to waste and not into the filter tub. By means of the pipes *f*, *f*, cold water can be directly injected into the jacket *a*, thus very materially aiding in the rapid cooling of the mash which is a very necessary and essential feature not only to economize time but also to prevent the formation of lactic acid which will be generated if a high temperature is maintained too long. By connecting water pipes with the direct steam inlets it is possible to introduce rapidly the water necessary to begin the mash, and also to inject more rapidly and distribute more uniformly than by any other means, the cold water to assist in cooling down preparatory to adding the malt.

By means of a test cock placed in the end of the machine uniform samples can be drawn as frequently as desired without stopping the stirring blades and dipping from the top.

Having now particularly described and ascertained the nature of my said invention and in what manner the same is to be performed, *I would have it understood that by the second of the claims hereinafter appearing I claim the improvement therein set forth only when the mash of the malt and grain therein referred to is made substantially in the manner set forth herein and claimed in the first claim* I declare that what I claim is :—

1. The improvement in the manufacture of beer or ale consisting in making a mash by mixing together raw grain and water and a portion of malt, gradually heating the entire mass to about 146° Fah. and then rapidly raising the temperature and maintaining the higher temperature until the starch globules are liberated, then at once cooling to a temperature below 165° Fah. then adding the remaining portion of malt required for the brew, maintaining the temperature over 155°, and subsequently filtering the wort, substantially as set forth.

2. The improvement in the manufacture of beer and ale from malt and raw corn, consisting in making the mash of the malt and grain, mixing the parts intimately together by mechanical action and discharging the entire mash at once into a filtering tub and there filtering the same, substantially as set forth.

3. The within described apparatus provided with a revolving shaft, carrying blades arranged at angles to thoroughly mix the mash, and with steam and water pipes whereby to inject steam and water into the mash and into a surrounding jacket, substantially as described and shewn *when used in connection with the processes herein described and claimed.*

4. The method and means of manufacturing ale and beer, substantially as hereinbefore described and shown.

Dated the 14th day of March 1892.

PHILIP M. JUSTICE.

London : Printed for Her Majesty's Stationery Office, by Darling & Son, Ltd.—1893

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Fig. 1.

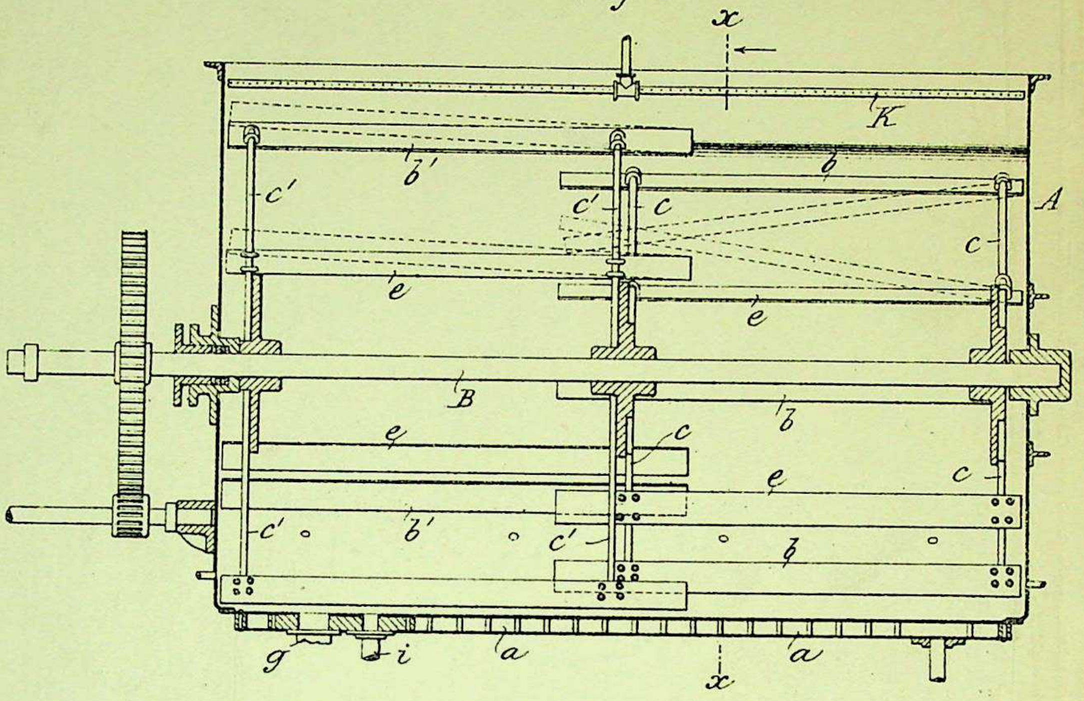

Fig. 3.

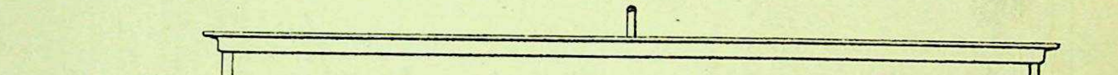

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Fig. 2.

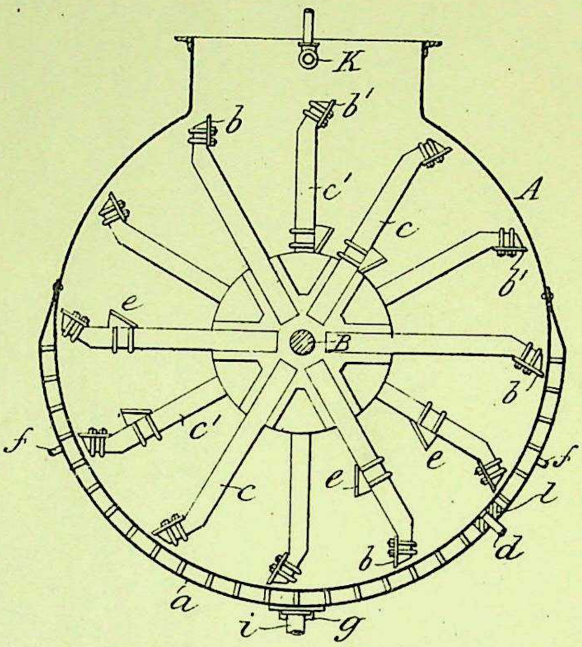
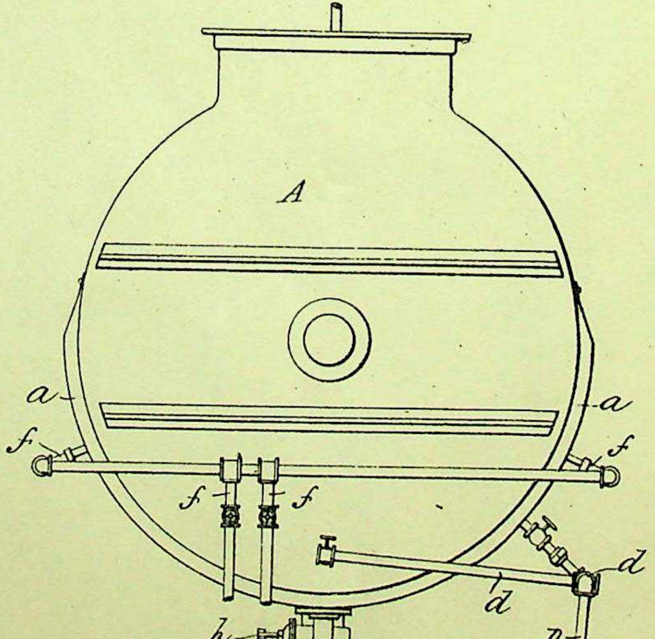


Fig. 4.



Malby & Sons, Photo-Litho.

FOODS AND BEVERAGES

426/29

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RECORDED
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U.S. 431246

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Nº 10,135 A.D. 1891

Date of Application, 15th June, 1891
Complete Specification Left, 14th Mar., 1892—Accepted, 16th Apr., 1892

PROVISIONAL SPECIFICATION.

An Improved Method of and Means for Manufacturing Beer and Ale.

A communication from abroad by Andrew Worthington Billings, of 997, Bedford Avenue, Brooklyn, in the State of New York, United States of America, Chemist.

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The use of raw grain in the manufacture of beer or ale has generally proved to be ineffective and where it has been employed with more or less success it has hitherto required the making of two mashes, one a supplemental mash containing raw grain, water and a portion of the malt used in the brew; the other or main mash consisting entirely of malt and water. A supplemental mash has heretofore been considered absolutely essential because of the high temperature and thorough agitation required to completely disintegrate and rupture the starch cells of the raw grain which can be done in the supplemental mash but another mash for the main malt is considered necessary because the exposure of the malt to the same agitation and high temperature would coagulate the diastase destroying the starch converting power and render difficult the subsequent filtration. The two mashes have therefore been separately prepared and then combined and the mashing operation completed.

Among the disadvantages of this method of manufacture are the increased cost of apparatus the additional skilled labour, time and steam required, the uncertainty of the yield and serious difficulties in filtering the water where the mashes are not properly mixed.

One object of this invention is to obviate the above difficulties by means of an improved process, and another object is to provide means for carrying out such process.

In working the improved process the raw grain either whole or ground together with a suitable proportion of malt say from 1 to 25 *per cent.* of the weight of the grain, and the necessary water, are introduced into a suitable mashing apparatus whereby the temperature of the mash may be quickly varied as required. After such introduction the temperature is gradually raised to about 146° Fahrenheit, whereby to enable the diastase which is most active at that temperature to convert any free starch present in the mass and to soften the outer cell walls in which the starch granules are contained. After this effect has been accomplished the mash is rapidly increased in temperature to a point sufficiently high to thoroughly gelatinize the starch contained in the raw grain. This point will depend upon the character of the grain and should not exceed at the utmost 200° Fah. even with grain of the most refractory character and the treatment is continued at this temperature until the thorough disintegration of the outer walls and the liberation of the granules of starch is effected, but the temperature should not be maintained after such liberation as it would result in a decomposition of fats and the production of empyreumatic products, which would render the solution unfit for the manufacture of a merchantable product. As soon therefore as the outer cuticle is broken up and the starch granules are liberated the mash is cooled down as rapidly as possible to below 165° Fah. and the remainder of the malt required for the brew is added with more water, if it is necessary, care being taken to avoid lowering the temperature to below 155° which would result in forming lactic acid.

The mash is now discharged rapidly from the tub into a separate and independent

[*Price 8d.*]

filtering tub. This rapid discharge of the mash into another tub is an important step in the improved method of manufacture and may be employed in other methods of manufacture where required as thereby the two substances are brought into intimate mixture with each other over the entire perforated filtering bottom the particles of corn being so effectually mixed with the malt that there can be no cementation of these particles together and the starch is thoroughly subjected to the action of the diastase and a perfect result is secured. In the ordinary method of manufacture where the malt and corn are thrown separately into a tub having a perforated bottom the corn grains stick together in masses preventing the extraction of maltose and the corn being heaviest goes to the bottom and coagulates in a mass covering the filtering openings.

This process may be carried out with apparatus of different forms but a preferred form consists of an improved tub having a hollow bottom preferably curved, with a suitable steam space.

A shaft concentric with the bottom carries two sets of arms, one set near one end of the shaft carrying blades, while the other set near the other end of the shaft also carry blades, so that the blades instead of extending the whole length of the shaft extend each one-half the length the two series alternating and each blade being so inclined at an angle to the arm and if desired supplemental blades may be carried by the arms and also some of the blades may be arranged to converge from opposite sides alternating with other blades diverging from the centre. By this means the substances of the thick mash are thoroughly commingled and quickly worked together so that all can be brought simultaneously to the same temperature. Steam from a pipe can be injected directly into the mass from a branch pipe, the nozzle of which points downward so as to operate when there is but a small quantity of mash in the tub and steam is admitted to the space in the jacket through a suitable pipe. The mash is discharged from the tub through a large opening controlled by a valve, and the wash water is discharged from the bottom of the tub through a pipe. All these pipes are provided with suitable valves or cocks, and by means of this construction the entire mass of grain or mash may be quickly raised and lowered in temperature as is necessary to secure the desired effect.

Dated this 15th day of June 1891.

PHILIP M. JUSTICE.

COMPLETE SPECIFICATION.

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In the ordinary method of manufacture where the malt and corn are thrown separately into a tub having a perforated bottom, the corn grains stick together in masses preventing the extraction of maltose, and the corn being heaviest goes to the bottom and coagulates in a mass, covering the filtering openings thereby preventing proper filtration. The mash is usually allowed to stand in the filtering tub from thirty to forty minutes or longer, when the taps can be opened and the filtered wort passing through the perforations in the false bottom can be pumped into the kettle. During this operation hot water at say about 168° Fah. is sparged or sprinkled on the surface of the grains remaining in the filtering tub until the soluble matter contained therein has been thoroughly extracted. The sparge or wash water is then mixed with wort contained in the kettle, and the subsequent boiling of the wort with hops, cooling, and then fermenting, continued as in ordinary brewing.

This process may be carried out with apparatus of different forms but a preferred form is shewn in the accompanying drawings, in which :—

Fig. 1 is a longitudinal sectional elevation.

Fig. 2 is a cross section taken on the line *x*—*x* of Fig. 1.

Fig. 3 is a side elevation, and

Fig. 4 an end elevation of Fig. 3.

A is the improved tub having a hollow bottom and a suitable steam space or jacket *a*.

A cylindrical shape of tub is preferred because oscillation of the machine is less with this form, and because a continuous and thorough agitation of all the grist contained therein is secured by means of the mixing blades which bring the material into direct contact with the heated or cooled surfaces. The whole length of the top of the machine is closed by hinged wooden covers, thereby preventing pressure and obviating the danger of evolving empyreumatic products.

A shaft B concentric with the bottom carries two sets of arms *c c*, c^1 c^1, the arms *c c* carrying blades *b*, while the arms c^1 c^1 carry blades b^1, so that the blades instead of extending the whole length of the shaft extend each more than one-half the length, the two series alternating, and each blade may be so inclined at an angle to the arm that the material will be evenly diffused through the machine owing to its receiving not only a turning but also a longitudinal motion or travel. If desired supplemental blades *e* may be carried by the arms and also some of the blades may be arranged to converge from opposite sides alternating with other blades diverging from the centre, or as indicated by dotted lines. By this means the substances of the mash are thoroughly commingled and quickly worked together so that all can be brought simultaneously to the same temperature without the formation of lumps of the grist or grain. Steam or water from a pipe D can be injected directly into the mass from branch pipes *d*, the arrangement being such that the steam or water is rapidly and uniformly distributed through the mass, thus enabling the temperatures to be readily and absolutely controlled, and insuring a perfect mixture of the materials composing the grist, thus securing an increased and uniform yield.

The pipes *d* pass through the jacket *a* through gun metal thickening pieces *l* riveted between the tub A and jacket *a*, thus enabling the inlets *d* to be placed as near the bottom of the machine as desired, so that either a large or small mash can be made. The thinness of the sheets composing the shells, and their unequal contraction and expansion would render this almost impossible without the thickening pieces.

To further aid in regulating the temperature hot or cold water or steam may be evenly distributed over the mash through the perforated or sparge pipe K. Steam or hot water for heating, and cold water for cooling may be admitted to the space in the jacket *a* through suitable pipes *f*, *f*, *f*. The mash may be rapidly discharged from the tub through a large opening *g* controlled by a valve *h*, and the wash water can be subsequently discharged from the bottom of the tub through a pipe *i*. All these pipes are provided with suitable valves or cocks, and by means of this construction the entire mass of grain or mash may be quickly raised and lowered in temperature as is necessary to secure the desired effect.

Briefly stated the entire operation is as follows :—

The tub A being provided with a suitable quantity of water which is brought to a temperature of about 120° Fah., the raw grain with the requisite quantity of malt is then fed in through the usual openings, while the apparatus is in motion. The temperature is then gradually raised to about 146° Fah., and maintained there for a period of 15 to 20 minutes, after which it is rapidly raised to a point not exceeding 200° Fah., at which point it is maintained until the grain is thoroughly gelatinized, a matter which can be ascertained by drawing off a sample through a suitable test cock. The mixture is then rapidly cooled until it stands at about 160° Fah. when the balance of the malt is added, care being taken not to unduly lower the temperature by this addition. When this addition has been completed the discharge pipe is fully opened and the entire mass rapidly discharged into the filtering tub.

The tub A may also be used as a boiling kettle, for which it is, on account of its immense heating surface, well adapted ; the cylindrical form gives a rolling boil, and with the blades slowly revolving all danger of boiling over is obviated.

By means of the pipe *i* it is possible to wash or clean the tub immediately after use, thus preventing the material baking or adhering to the sides, from which after setting it can only be removed with difficulty. The wash water from this operation should of course be discharged direct to waste and not into the filter tub. By means of the pipes *f*, *f*, cold water can be directly injected into the jacket *a*, thus very materially aiding in the rapid cooling of the mash which is a very necessary and essential feature not only to economize time but also to prevent the formation of lactic acid which will be generated if a high temperature is maintained too long. By connecting water pipes with the direct steam inlets it is possible to introduce rapidly the water necessary to begin the mash, and also to inject more rapidly and distribute more uniformly than by any other means, the cold water to assist in cooling down preparatory to adding the malt.

By means of a test cock placed in the end of the machine uniform samples can be drawn as frequently as desired without stopping the stirring blades and dipping from the top.

Having now particularly described and ascertained the nature of my said invention and in what manner the same is to be performed, I declare that what I claim is :—

1. The improvement in the manufacture of beer or ale consisting in making a mash by mixing together raw grain and water and a portion of malt, gradually heating the entire mass to about 146° Fah. and then rapidly raising the temperature and maintaining the higher temperature until the starch globules are liberated, then at once cooling to a temperature below 165° Fah. then adding the remaining portion of malt required for the brew, maintaining the temperature over 155°, and subsequently filtering the wort, substantially as set forth.

2. The improvement in the manufacture of beer and ale from malt and raw corn, consisting in making the mash of the malt and grain, mixing the parts intimately together by mechanical action and discharging the entire mash at once into a filtering tub and there filtering the same, substantially as set forth.

3. The within described apparatus provided with a revolving shaft, carrying blades arranged at angles to thoroughly mix the mash, and with steam and water pipes whereby to inject steam and water into the mash and into a surrounding jacket, substantially as described and shewn.

4. The method and means of manufacturing ale and beer, substantially as herein before described and shown.

Dated the 14th day of March 1892.

PHILIP M. JUSTICE.

London : Printed for Her Majesty's Stationery Office, by Darling & Son, Ltd.—1892